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Kalkhoff Impulse Ergo NuVinci Harmony

With motor power linked to your heartrate, and wide-range automatic gear shifting, Kalkhoff's Ergo brings new technology to cycling. But does it work?

Kalkhoff are one of Germany's major cycle producers, and their extensive range includes a wide range of e-bikes. After using Panasonic crank drive systems for several years, often with their own extended-capacity batteries, they developed an 'Impulse' drive of their own. This has been further developed since its introduction with both software and hardware tweaks.

Kalkhoff bikes are imported to the UK by 50Cycles, who sell them from their two stores in Hampton Wick (South London) and Loughborough (Leicestershire) and direct to customers across the UK with free delivery. There are demonstrator bikes available at 'dozens' of locations throughout the UK, via hire services or enthusiastic owners.

The 'Ergo' model reviewed here is at the top of the Kalkhoff e-bike line-up price-wise, with a recommended retail price of £2995, although 50Cycles have it on offer for £2495 as we go to press. Like all of the Kalkhoff range it comes with a full two year warranty covering all parts including the battery.

Specification

Weight overall (inc batteries): 26.06 kg
Battery weight: 2.92 kg
Bike only weight: 23.14 kg
Charger weight: 0.74 kg (inc. mains cable).
Battery type: Li-Ion.
Battery capacity: 540 Watt hours (15Ah 36V).
Gearing: NuVinci automatic continuously variable, 360% range.
Brakes: Magura HS11 hydraulic rim brakes.
Lighting: Front LED, rear LED.
Other accessories fitted: Mudguards, carrier rack, stand, bell.
Price as tested: £2499.

» ON THE BIKE

The Impulse Ergo is a classy looking machine: better perhaps in the flesh than in the photos. The finish really is good seen close up: there's smooth-welded frame joints, fine detailing in the graphics and quality parts all over. The bike comes fully equipped with rack, mudguards, and stand, all neatly mounted. There's also a frame lock using the same key that releases the battery. Even here the quality is apparent: the key is a high security type with pits in its face, rather than the more easily picked or copied serrated edge.

A very bright hub dynamo powered lighting system is also fitted: the headlight even has LED daytime running lights, and the 'Flatsafe' rear light is a special Kalkhoff/B&M development which brightens when the motor detects the bike slowing down. Both have 'standlight' systems, so they stay on for several minutes once you stop.

ABOVE: The Ergo is a smart looking bike. Please forgive the odd angle of the headlight in several of these pictures: my fault entirely for not spotting it before the photo shoot.

LEFT: Quality components all round, with hydraulic rim brakes from Magura and a useful AXA frame lock which will quickly immobilise the bike with the shackle passing through the rear wheel spokes. On a bike this expensive, you'd probably want to use another lock too to secure it to something solid!

Then there's quality forks and suspension seatposts, and excellent Magura hydraulic rim brakes with a lovely feel. And super-comfortable ergonomic handlebar grips. And a saddle supported by a sort of suspension cushion at the back. But enough! I'm impatient to move on to the really interesting bits, the electrics and transmission.

Let's start with the gearing system, the Harmony 360 from NuVinci. This is a continuously-variable drive, so there are no steps between the gears. Instead, the ratio can be varied smoothly from gearing up (for speed) to gearing down (for hills) over a 360% range (so top gear is 3.6 times higher than bottom gear). For automotive engineering fans, it works something like the long-promised Torotrak transmission, with the drive running through steel balls on cunningly angled pivots. That need not concern

the owner, though: it's a sealed unit and no maintenance should be needed.

The automatic shifting unit is fitted just below the chain drive, and it's connected to the bike's electrical system via a connector to ease wheel removal for puncture fixing and the like. The shifter takes a little electrical power from the main battery to change speeds, but I very much doubt it's enough to affect range significantly.

To control the system you have a twist-grip for your right hand, complete with illuminated read-out. There are two modes, selected via the button above the read-out. Simplest is 'manual': just twist the grip one way for higher gears and the other for lower. The shifter activates the hub accordingly, and your current ratio is shown on the orange scale.

In 'Auto' mode, the orange scale disappears and a blue one illuminates, with a strange 'spin' logo. The idea is that you select your preferred pedalling speed, and the hub attempts to keep you within that range. It does this by sensing the bike's speed, so if you're going fast it knows you need a high gear, and if you're slowing to a halt, you'll need a low gear to start off again. As we'll see, it does this pretty well.

Let's now move on to the electrical system. The Impulse drive itself is tucked away below the battery, which follows the curve of the rear wheel to form a sort of integrated mudguard. But again there's not much for the user to concern themselves with here: it's all sealed away. The battery does seem very compact for its hefty 15 Ah, 36 V capacity. It clicks easily in and out of its mounting, but you can charge it on the bike too.

TOP: The Impulse drive and battery unit is neatly built into the frame.

ABOVE: The display can show all sorts of data: the 'SET' button on the remote pad scrolls through the various screens.

ABOVE RIGHT: The automatic shifting unit is connected to the bike's electrical system by a waterproof plug for easy rear wheel removal.

RIGHT: The Ergo is fitted with comfortable ergonomic grips.

RIGHT: Buttons to control the Impuse system are located in easy reach of your left hand. Below is a bell.

LEFT: The gear shifting control in manual (TOP) and automatic (BOTTOM) modes.

At the handlebars, there's a neat control unit near your left hand, linked to the main display. This is solidly mounted to the bike's stem via two Allen bolts: it sits absolutely secure at your chosen angle. The backlit LCD panel is in two parts: a large fixed display for speed, mode, battery status and range, and a lower section which can display text, with a wide selection of info screens available. This is also very handy for setting your heart rate zones or configuring other aspects: you're always prompted in plain English.

The controller offers three 'normal' modes (Eco, Sport, Power) and, on this bike, a fourth 'Ergo' setting. The first three are straightforward: you get more assistance as you go through the list. This is a torque sensing system, so it measures your efforts and adds to them.

It's the 'Ergo' setting where this bike becomes special. The concept is that the bike takes your heart rate (transmitted wirelessly from the chest strap supplied) and displays it on the monitor. You set a target rate, and how many beats per minute (up to 20) above that the 'warning' beep should sound. The bike then tries to keep you in that zone. To do this it'll apply extra motor power if your heart rate gets too high, or tail off the power if you're falling below your target.

Clearly there may be good medical reasons not to exceed particular levels of exertion, and your doctor will advise the threshold heart rate to enter. The Ergo system will ensure that for your chosen level of exertion the bike provides assistance to keep you moving as fast as possible, so you can minimise journey time despite having limited output yourself.

Conversely, many sports therapists will confirm that heart rate-based training is among the most effective methods: this involves maintaining a certain target rate over a fixed period. So if you're doing 'too well' the motor will tail off, and eventually you'll be riding unassisted. This could be a great way for those recovering from injury or illness to gradually regain strength before, if they wished, moving back to unassisted riding or other sports.

So far so good: let's get on the road and see how the bike performs!

» ON THE ROAD

There are two dynamic, automatic systems working together on this bike, the heartbeat control and the gearing, so it's a challenge for me to communicate just how they both work, alone and in combination, in the space available. It really is far easier to ride than to analyse!

We'll start with the power assist switched off, and the gears in manual control. As you pedal off and speed up, you can twist the grip and the gears shift for you, with a barely audible buzz. The transmission is smooth and otherwise silent as far as I could tell. Bottom gear is fine for moderate slopes unassisted, but any more and it's hard work.

Now let's try automatic mode, with the 'clock' for pedalling speed somewhere in the middle. If you switched over at a standstill, nothing happens: the system waits until you're rolling before making any change. As you set off it'll shift you quickly into a low gear (it can run through its range in a second or so) then, as you speed up, the ratio will rise too, keeping your feet spinning at much the same rate. It is verging on uncanny. The speed just keeps building until you hit the end of the NuVinci's range. Then, to go faster, you simply need to spin the pedals faster. The blue display starts blinking at this point to let you know it can't cope. But slow down and it'll catch up again, shifting right down to bottom gear as you come to a halt.

It's super clever but not flawless: several times it 'lost track' of which gear it was in, and just wouldn't shift up to top gear. A quick read of the manual revealed that this had been anticipated: you just press the 'mode' button for a few seconds and the system recalibrates itself, running up and down over the full range as you ride along. Ingenious stuff, but it does break your flow somewhat. Occasionally, too, very fast changes of pedalling rate such as accelerating away from traffic lights would outspeed the system, leaving you pedalling on air for a moment until it catches up. Again, the manual advises against this: it's designed for more dignified riding.

But overall the Harmony system was highly impressive – automatic shifting that actually works!

So to the Impulse drive. From a standstill, the Impulse responds positively, with an almost instant gentle 'spurt' of power to get you going, then steady boost as your legs keep spinning. The gears keep pace, too, and you're soon through the 15.5 mph limit, at which the motor fades gently out until all assistance is gone by about 17 mph. The motor is not completely silent but the buzz is so low it's barely audible.

For hills, the gearing switches to a low gear so the assist's torque is boosted at the back wheel to pull you up. I didn't find a hill steep enough to defeat it with just modest pedalling input from me – though I did trigger the heartrate alarm once or twice!

So to the main event. Switch the controller into 'Ergo' mode and the display asks you to put the heartrate transmitter around your chest. It's a slim plastic unit, with soft elastic length-adjustable straps, and once it's on you hardy feel it.

If all goes well the display says 'Determining heartbeat' for a few seconds then your heartrate is displayed. Occasionally though, the transmitter seemed not to switch on, and the display wouldn't budge from the 'Put on the chest strap' message. This usually solved itself after a few minutes of riding. Again back to the manual, which advises that wetting the back of the transmitter before putting it pon solves this: some moisture is needed for conductivity.

Then, as my heartbeat rose towards the target, the assist would come in smoothly, easing any further effort.

The update rate seemed good, and it's fascinating to see your heartbeat respond to exertion, traffic stress or even just your thoughts: most people can exert some control through mental efforts. But bigger swings do come from physical work, and deliberately pushing hard up a moderate hill soon had my heartrate rising from the high 90s of 'just riding along' (with a very modest target of 100) through the 120 alarm level. At this point a very loud repeated beep warned me to ease off.

Setting the target higher changes the ride experience rather. With a target of say 120, the bike made me work by stubbornly refusing to offer any assistance (except for a tiny blip to help set off) until I was actually putting in an effort. As a training tool this is superb: it's a built in laziness preventer, without hampering the electric assist's help when you really need it.

Linking assist to heartbeat in this way does have its downsides. If you've been relaxing at traffic lights and your heart rate is down, you'll have to struggle away unassisted until your heartbeat has risen again. If you're doing a lot of stop/start riding in traffic I'd use the other modes, and save the Ergo system for the open road: combined with the auto gear shifting it's brilliant on rolling hills.

And the rest of the bike? All good, excellent comfort, good brakes and a rattle-free ride.

HIGH POINTS:

Unique heart rate function

Impulse drive performs well

Huge battery

Top build quality

LOW POINTS:

Expensive

Complex (but backup should be good)

GOOD FOR:

Riders with a medical need

Serious fitness users

Gadget fans!

Available from:

50Cycles: Tel 0333 900 5050 or see *www.50cycles.com*

» SUMMARY

The Kalkhoff Impulse Ergo NuVinci Harmony may be a handful to say, but it contains fistfuls of interesting technology. The key feature, the unique heart rate monitoring and control system, works amazingly well. Even if you don't need it medically, it's both good fun and useful to have the clear heartrate readout on the display, and if you're serious about using the bike for fitness training it could be a key feature.

The interaction of the heartrate system with the smooth, automatic gear-changing from NuVinci is seamless too, resulting in a bike you can, more or less, just set up and go. Both systems have their limits of course, but you mostly have to make an effort to reach them.

There is some complexity in all of this of course, but it's well explained in the very clear manual. Even less technically minded riders shouldn't be put off.

It's also good that the bike works perfectly well if you don't fancy putting on the heartrate chest strap. In its standard assist modes the latest Impulse drive is a class act, with plenty of power and that eager little push as you set off. Driving through the gears, it'll get you up almost any hill.

It's all wrapped into a bike which is beautifully finished, equipped with premium parts throughout, and with a huge-capacity yet surprisingly compact battery pack. It has one of Germany's biggest brand names behind it, too.

This all comes at a price, of course, but I think you get your value here.

Peter Eland